

Vulture-Cattle Interactions – A Survey of Florida Ranchers

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ABSTRACT: Effective management of vertebrate pest populations is enhanced by greater understanding of stakeholder-pest interactions as well as stakeholder attitudes toward control of the problem species. It has long been reported that black vultures are responsible for depredation of livestock, especially newborns. To gain a better understanding of this phenomenon, we conducted a survey of 374 Florida cattle ranchers, representing roughly 2% of the total number of Florida cattle ranches. A 3-page questionnaire was used to gather information of ranch characteristics and whether or not the ranchers had experienced vulture attacks. In cases where vulture attacks were reported, respondents were asked to quantify the value of property lost to vultures and preventative measures taken to reduce vulture predation. All respondents were asked a similar set of questions regarding coyotes as well as a series of questions concerning their attitudes toward vulture control and regulations. The survey revealed that 38% of respondents had experienced vulture predation that, on average, resulted in over \$2,000 damage. Important predictors of vulture predation were ranch size and number of cattle. Attacks were recorded throughout the year, with the greatest number occurring during the winter months. By gaining better knowledge of stakeholder views and opinions, as well as the extent and characteristics of their depredation problems, we can more efficiently address the needs of livestock ranchers to reduce vulture damage.

KEY WORDS: black vulture, *Canis latrans*, *Coragyps atratus*, coyote, Florida, livestock, predation, survey, vultures

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INTRODUCTION

Black vulture (*Coragyps atratus*) populations appear to be increasing throughout their range (Avery 2004, Sauer et al. 2005). Black vultures are opportunistic predators and will readily subdue and eat vulnerable live animals including livestock (Baynard 1909, McIlhenny 1939, Mrosovsky 1971, Dickerson 1983, Lowney 1999). In conjunction with rising black vulture populations, there has been an increase in reports of black vulture predation/damage (Avery 2004, Anonymous 2005). Recent research efforts have attempted to gain a more complete understanding of this phenomenon through direct observation (Humphrey et al. 2004, Avery et al. 2006). In a field study in central Florida, researchers found that vultures are preferentially attracted to calving pastures, and that they take advantage of the availability of afterbirth as a food source (Humphrey et al. 2004). Such behavior might set the stage for vultures to encounter and attack newly born calves or cows having trouble giving birth.

To better understand the issues surrounding negative vulture-cattle interactions, more data is needed on the proportion of ranches that experience vulture predation. We need to isolate the factors that predispose some ranches to vulture predation and increase our information on the efficacy of deterrent methods that ranchers currently use to manage problems caused by vultures. One way to gain insight into this issue is to survey ranchers who regularly deal with livestock. To this end, we attempted to learn more about the impact of vultures on livestock in Florida through the use of a mail questionnaire sent directly to cattle ranchers throughout the state.

METHODS

Survey Participants

A sample of 3,000 ranchers was randomly selected from a pool of 6,434 Florida Farm Bureau members with livestock holdings. A postcard was mailed to each potential respondent in the sample two weeks prior the questionnaire to explain the survey. Surveys were then mailed to the sample of ranchers. Only one mailing was performed, with no follow-ups due to cost restrictions.

Survey Instrument

The survey consisted of 14 questions (see Appendix). The first 5 questions asked for basic information about the size of the ranch, number and type of livestock, and whether or not vultures attacked the rancher's livestock. If the respondent answered "yes" to the question "Do vultures attack your livestock?", they were then asked a series of questions about the timing of vulture attacks, the victims of vulture attacks, and control methods attempted by the respondent. In addition to vulture predation, all respondents were asked if they suffered losses to coyotes (*Canis latrans*). The final question on the survey asked respondents to read a series of statements. For each statement, respondents were asked to indicate their level of agreement, ranging from "strongly disagree" to "strongly agree". These rankings were then coded to a scale of 1 to 9. The answer "unsure" was not counted. For analyses, respondents were split into two groups, based on their answer to the question "Do vultures attack your livestock?". The independent-samples t test was used to compare mean responses scores between the two groups. All data were analyzed using SPSS statistical software (SPSS for Windows, Release 11.0.1). A total of

448 questionnaires were returned for a response rate of 15%, representing 60 of Florida's 67 counties.

Landscape Level Analysis

We also looked at the survey data from a landscape level perspective. Survey respondents who included their address (discarding P.O. boxes) were entered into a geodatabase. StreetMap USA address locator (ESRI StreetMap extension for ArcMap 9.1) was used to geocode the addresses to physical coordinates. We focused on landfills, due to the likelihood for association between vultures and landfills. All active class 1 and 2 landfills and transfer stations (Anonymous 1997) were plotted on the same map. The distance from each ranch to the nearest landfill or transfer station was then calculated using ArcMap Spatial Analyst.

RESULTS

Ranch Data

Of the 448 forms returned, 43 were omitted from the analyses due to discrepancies or the fact that they reported having no livestock. Thus, 405 were included in the final analyses.

There was considerable variation in ranch size. The mean ranch size was 370.7 (± 1912.9) hectares (range: 1.01 - 34,398.28 hectares). The mean number of cattle across all ranches was 215 (± 1099.4). Mean cattle density was 1.03 (± 1.1) cows per hectare (range: 0.03-12.36 cows per hectare). In addition, there were 9 ranches ≥ 1 sheep, 21 ranches with ≥ 1 pigs, and 35 ranches with poultry. A small number of ranches had horses, goats, emus, rabbits, donkey, or water buffalo.

Vulture Attacks

Question 5 on the survey asked 'Do vultures attack your livestock?'. Two-hundred fifty-eight respondents (63.7%) answered "no", while 147 respondents (36.3%) answered "yes". The mean ranch size of those who answered "no" was 97.9 hectares and was smaller than the mean size of 850 hectares reported by those who answered "yes" ($t = -2.926$, $P = 0.004$) (Figure 1). The mean number of cattle followed a similar pattern with those answering "no" to this question reporting fewer cattle than those who answered "yes" ($t = 3.109$, $P = 0.002$) (Figure 2). However, there was no significant difference in livestock density between the two groups ($t = -0.854$, $P = 0.394$).

Respondents reported that most vulture attacks occurred between November and March (Figure 3). A majority of respondents reported attacks at midday, followed by morning, and evening (Figure 4).

Several questions were designed to elicit responses regarding the pattern of vulture attacks around birthing. In response to the question asking if animals were attacked while giving birth, 90% of respondents answered "yes". A majority of respondents (59%) also answered "yes" when asked if first-time reproductive females were more likely to be attacked than older females. Finally, 95% of respondents answered "yes" when asked if newborns were attacked by vultures.

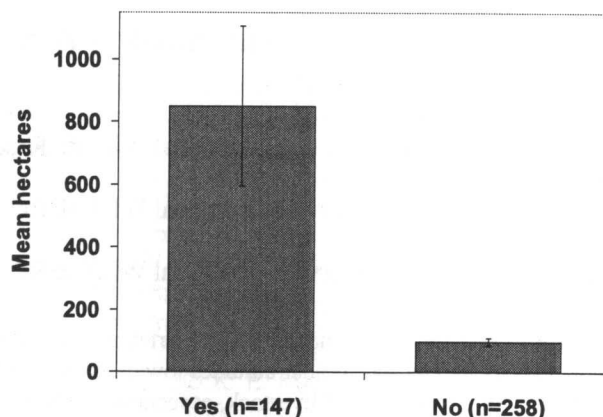


Figure 1. Mean ranch size (ha) reported by ranchers who answered either "yes" or "no" to the question "Do vultures attack your livestock?" Error bars show mean ± 1.0 SE.

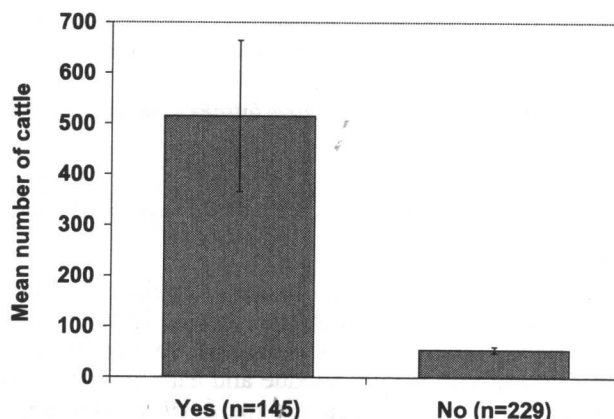


Figure 2. Mean number of cattle reported by ranchers who answered either "yes" or "no" to the question "Do vultures attack your livestock?" Error bars show mean ± 1.0 SE.

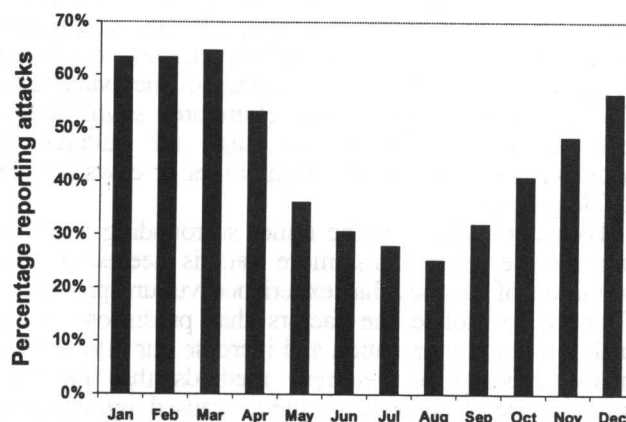


Figure 3. Percentage of ranchers surveyed who reported experiencing vulture attacks each month ($n = 147$).

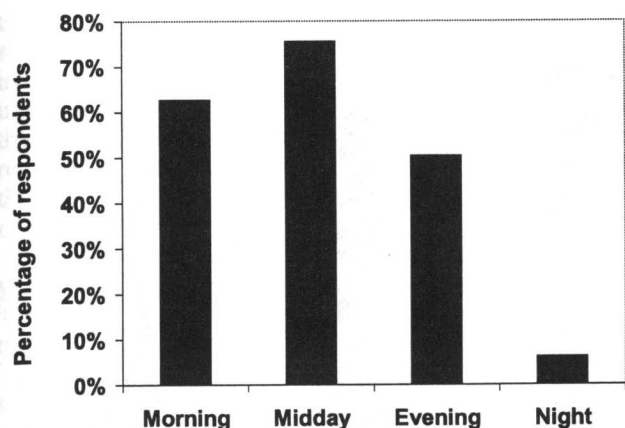


Figure 4. Percentage of ranchers surveyed who reported experiencing vulture attacks during each time period (n = 147).

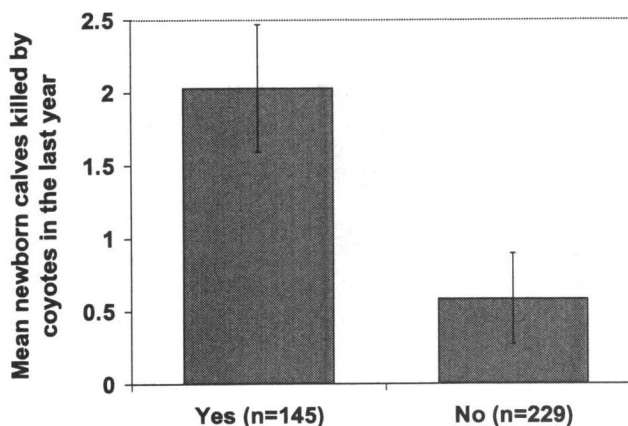


Figure 5. Mean newborn calves reported killed by coyotes in the last year by ranchers who answered either "yes" or "no" to the question "Do vultures attack your livestock?" Error bars show mean ± 1.0 SE.

Number and Value of Livestock Lost to Vultures

Predation on newborn calves by vultures exceeded the amount of predation on all other species and age classes, and accounted for 82.4% of all livestock lost (Table 1). Of the respondents that reported vulture predation to cattle, the mean number of newborn calves reported lost to vultures in the last year was 7.8 (± 20.6), yearlings 0.21 (± 0.14), and adults 0.8 (± 0.18). Finally, total value of cattle lost was \$316,570 with a mean of \$2,595 ($\pm \$5,728$).

Coyote Damage

The level of coyote predation to livestock was also solicited for response on this survey. Of the subset of respondents that responded to Question 13 ("How many animals do you lose annually to coyotes, and what is the value of the animals lost to coyotes?"), the mean number of newborn calves killed by coyotes was higher for those who answered "yes" to Question 5 ("Do vultures attack your livestock?"), than for those who answered "no" ($t = -3.712$, $P < 0.001$) (Figure 5).

On ranches of 200 hectares or less, the mean number of newborn calves killed by coyotes was also higher for those who answered "yes" to Question 5, than those who answered "no" ($t = -3.01$, $P = 0.003$). On ranches of 121 hectares or less, this pattern was the same, although it was not significant at a 95% confidence level ($t = -2.06$, $P = 0.051$).

Deterrent Methods

Respondents reported a variety of control or deterrent methods. Each deterrent method given was assigned to one of the following groups: use of dogs, attractant removal, shooting, traps, human presence, scarecrow/effigy, or none. A mean effectiveness score was then assigned to each method (Table 2). The use of dogs was rated the most effective, followed by attractant removal and shooting.

Opinion Questions

Responses to the nine opinion questions are summarized in Figures 6 and 7. For the statements "Vulture predation to livestock is a problem on my farm" (Statement A), "Numbers of vultures in my area are increasing" (Statement B), "Current methods for control-

Table 2. Methods used, number reporting that method, and mean effectiveness rating. Effectiveness was rated on a scale of 1-5, 5 being the most effective.

Method	n	Mean effectiveness (1-5)
dogs	6	3.5
attractant removal	21	3.2
shooting	39	3.0
traps	2	3.0
human presence	61	2.8
scarecrow/effigy	2	2.5
none	5	0.2

Table 1. Mean numbers and values of newborn, yearling, and adult livestock reported lost to vultures during the past year.

	Newborn		Yearling		Adult		Total Value		n
	Total	Mean	Total	Mean	Total	Mean	Total	Mean	
Cattle	956	2.56	25	0.07	101	0.27	\$316,570	\$846	374
Sheep	10	1.11	0	0.00	0	0.00	\$500	\$56	9
Pigs	50	2.38	0	0.00	0	0.00	\$250	\$12	21
Poultry	0	0.00	0	0.00	17	0.50	\$80	\$2	35

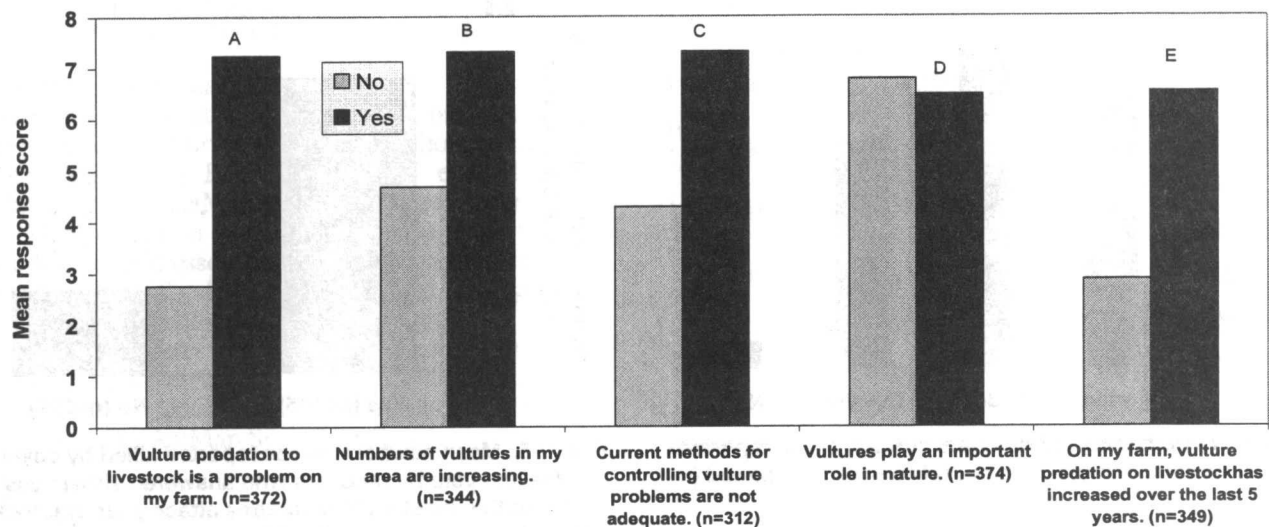


Figure 6. Mean response score to various statements for the two groups of ranchers who answered either "yes" or "no" to the question "Do vultures attack your livestock?" Response scores of 9 indicate complete agreement with the statement, while scores of 1 indicate complete disagreement. Responses of "unsure" were not counted.

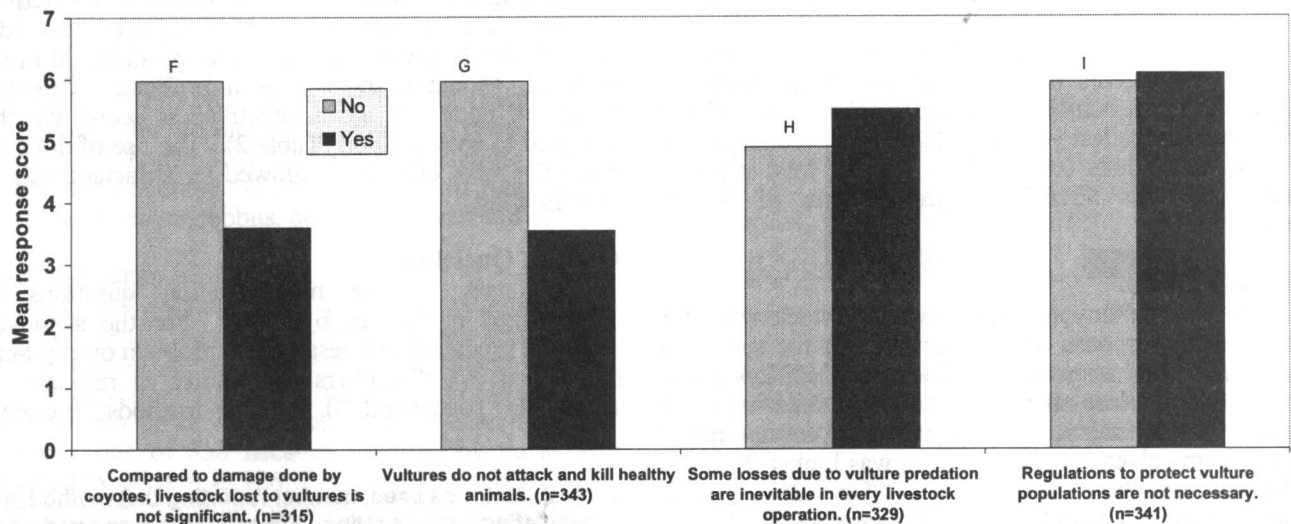


Figure 7. Mean response score to various statements for the two groups of ranchers who answered either "yes" or "no" to the question "Do vultures attack your livestock?" Response scores of 9 indicate complete agreement with the statement, while scores of 1 indicate complete disagreement. Responses of "unsure" were not counted.

ling vulture problems are not adequate" (Statement C), "On my farm, vulture predation on livestock has increased over the last 5 years" (Statement E), and "Some losses due to vulture predation are inevitable in every livestock operation" (Statement H), the mean response score was higher for the group reporting vulture attacks (A: $t = -22.7$, $P < 0.001$; B: $t = -11.0$, $P < 0.001$; C: $t = -7.9$, $P < 0.001$; E: $t = -15.5$, $P < 0.001$; H: $t = -2.3$, $P = 0.022$). The opposite held true for the statements "Compared to damage done by coyotes, livestock lost to vultures is not significant" (Statement F), and "Vultures do not attack and kill healthy animals" (Statement G) (F: $t = 8.5$, $P < 0.001$; G: $t = 8.4$, $P < 0.001$). There was no significant difference in mean response scores for the

statements "Vultures play an important role in nature" (Statement D), and "Regulations to protect vulture populations are not necessary" (Statement I).

Landscape Level Analyses

A total of 235 ranches were geocoded based on addresses provided by the participants, of which 97 reported vulture attacks. The distance from ranches to the nearest landfill or transfer station did not vary between those that reported vulture predation and those that did not ($t = -8.46$, $P = 0.398$).

DISCUSSION

While count data show that vulture populations are on

the rise (Sauer *et al.* 2005), and Wildlife Services reports show that the number of vulture attacks on livestock are increasing (Avery 2004, Anonymous 2005), it is important to obtain an inside look from the ranchers themselves. Although only 15% of our mailings were returned, our respondents represented 60 of 67 counties throughout the state, and were quite diverse in terms of ranch size and animals owned.

Slightly more than one-third of respondents answered yes to the question "Do vultures attack your livestock?" The mean ranch size of those who answered "no" was much smaller than that of those who answered "yes". This is likely due to several factors. Larger ranches simply represent a larger portion of a vulture's foraging area. Similarly, larger ranches have more cattle which create more feeding opportunities for vultures in the area. A more subtle reason may be the fact that at larger ranches it is more difficult for operators to patrol the entire ranch. Teasing apart these causes is impossible with the current data set and will require additional site-level research.

Although larger ranches were more likely to experience vulture predation, some owners of very small ranches (<8 hectares) reported vulture attacks. Determining what separates these ranches from other small ranches may help to isolate the factors leading to vulture depredations.

Respondents reported surprisingly large numbers of vulture-caused livestock losses (Table 1). It is impossible, however, to determine what percentages of these were perceived as being caused by vultures and which were actually caused by vultures. Black vultures found feeding on a dead calf are usually blamed for the death, although the calf might have died of unknown and unrelated causes (Avery and Cummings 2004). Annually, roughly 7% of U.S. Holstein calves die within 48 hrs due to unknown causes (Meyer *et al.* 2000); nevertheless, there is ample evidence that black vultures do prey on newborn calves and are responsible for some percentage of reported incidents.

It is also worth noting that the majority of vulture attacks reported occurred during calving season in Florida. Moreover, the majority of respondents said that newborn livestock were attacked by vultures, often during birthing. The fact that heifers are reportedly more susceptible to attack may indicate that ranchers can concentrate their deterrent efforts on these first-time mothers.

We hoped to gain some insight into general predation susceptibility by asking questions about coyote predation as well as vulture predation. Reported coyote damage was less costly than vulture damage (Figure 8). This corresponds with calf losses reported to Wildlife Services over the past 5 years (<http://www.aphis.usda.gov/ws/tblfrontpage.html>), where 151 were due to vulture attacks and only 2 to coyote attacks. This difference in reports may be due to several factors, including misplaced blame, the nocturnal nature of coyotes, or fencing successfully deterring coyotes. However, due to the survey's strong focus on vulture predation, it is possible that respondents gave less thought to the coyote questions.

Of interest was the fact that coyote damage was higher for ranches that experienced vulture predation (Figure 5), and that this held true for ranches less than 200 hectares in area. This suggests that characteristics that make a ranch susceptible to one type of predation may make it susceptible to other types.

Not only did we want to know what made ranches susceptible to predation, we wanted to know what ranchers had done to prevent vulture predation and how successful their methods were. Although use of dogs was the highest rated control method, it was one of the least used deterrent methods reported (Table 2). This is likely due to the additional time and money required to use trained dogs. Nonetheless, we feel that if reports of vulture damage are accurate, a benefit-cost analysis may cast the use of trained dogs in a favorable light. Second, in terms of average effectiveness, was removal of attractants. Responses grouped into this category consisted of statements similar to "bury dead cows", or "bury afterbirth". Based on field observations (Avery *et al.* 2006), this type of attractant is often overlooked in livestock operations.

In all actuality, the category of shooting and the category of human presence are probably essentially the same, only differing in terms of scale. On average, both methods were reported to be more effective than not. What we don't know is the degree of time or effort that each respondent put into this deterrent strategy.

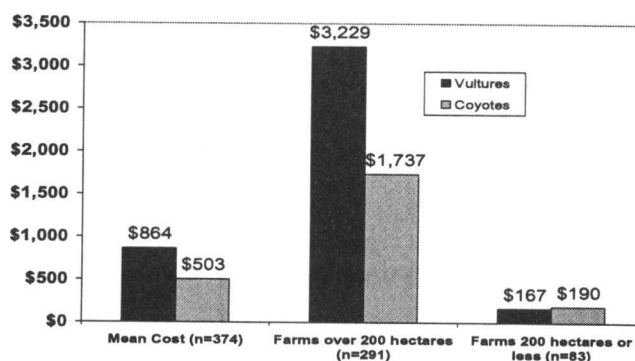


Figure 8. Mean annual costs of vulture and coyote damage to all farms, and farms over and under 200 hectares, as reported by survey respondents.

Opinion Questions

The responses to the statements "Vulture predation to livestock is a problem on my farm" (Statement A), "Numbers of vultures in my area are increasing" (Statement B), "Current methods for controlling vulture problems are not adequate" (Statement C), and "On my farm, vulture predation on livestock has increased over the last 5 years" (Statement E) are what we would expect, with those answering "yes" more likely to agree (mean score closer to 9) with those statements that indicate a problem with vultures. Surprisingly, the mean score for both groups was closer to agreement than disagreement for the statement "Vultures play an important role in nature" (Statement D). This may reflect a general

appreciation for the ecosystem services provided by otherwise unpopular species. Responses to the statements "Compared to damage done by coyotes, livestock lost to vultures is not significant" (Statement F), and "Vultures do not attack and kill healthy animals" (Statement G) also followed expectations, with the "yes" group more likely to disagree. Responses were fairly neutral (mean score closer to 4.5) to the statement "Some losses due to vulture predation are inevitable in every livestock operation" (Statement H), and both group slightly agreed with the statement "Regulations to protect vulture populations are not necessary" (Statement I), which seems to contrast with the response to Statement D.

Landscape Level Analyses

We wanted to complete our analysis by examining any potential landscape level effects. Our primary focus was the occurrence of landfills or transfer stations, which are known to be attractants for both black and turkey vultures, (*Cathartes aura*). We found no apparent influence of proximity to landfills on vulture attacks. It is possible that because trash facilities are such reliable sources of food, the vultures using them are not actively seeking out additional food supplies. Additionally, while it appears that vulture populations are increasing (Avery 2004, Sauer *et al.* 2005), we know little about the distribution of vulture roosts across the landscape. What is likely is that a variety of factors predispose certain ranches to vulture predation, including location, size, and the practices of the rancher. While we have begun to identify the right questions to ask, more work needs to be done to understand fully the problem of vulture predation on livestock.

LITERATURE CITED

- ANONYMOUS. 1997. Solid Waste Facilities (shape file), Florida Department of Environmental Protection, Division of Waste Management, 2006.
- ANONYMOUS. 2005. Wildlife Services Annual Tables, Wildlife Services, 2006.
- AVERY, M. L. 2004. Trends in North American vulture populations. *Proc. Vertebr. Pest Conf.* 21:116-121.
- AVERY, M., AND J. L. CUMMINGS. 2004. Livestock depredations by black vultures and golden eagles. *Sheep and Goat Res. J.* 19:58-63.
- AVERY, M., J. S. HUMPHREY, E. A. TILLMAN, AND M. P. MILLESON. 2006. Responses of black vultures to roost dispersal in Radford, Virginia. *Proc. Vertebr. Pest Conf.* 22:239-243.
- BAYNARD, O. E. 1909. Notes from Florida on *Catharista urubu*. *Oologist* 26:191-193.
- DICKERSON, D. D. 1983. Black vultures kill skunk in Mississippi. *Mississippi Kite* 13:2-3.
- HUMPHREY, J. S., E. A. TILLMAN, AND M. L. AVERY. 2004. Vulture-cattle interactions at a central Florida ranch. *Proc. Vertebr. Pest Conf.* 21:122-125.
- LOWNEY, M. S. 1999. Damage by black and turkey vultures in Virginia, 1990-1996. *Wildl. Soc. Bull.* 27:715-719.
- MCILHENNY, E. A. 1939. Feeding habits of the black vulture. *Auk* 56:472-474.
- MEYER, C. L., P. J. BERGER, AND K. J. KOEHLER. 2000. Interactions among factors affecting stillbirths in Holstein cattle in the United States. *J. Dairy Sci.* 83(11):2657-2663.
- MROSOVSKY, N. 1971. Black vultures attack live turtle hatchlings. *Auk* 88:672-673.
- SAUER, J. R., J. E. HINES, AND J. FALLON. 2005. The North American Breeding Bird Survey, results and analysis 1966-2004. USGS Patuxent Wildlife Research Center, Laurel, MD.

Vulture Livestock Damage Questionnaire

The Florida Farm Bureau is conducting this survey of vulture damage to livestock in cooperation with the USDA National Wildlife Research Center. The purpose is to measure losses of livestock and to assist in developing effective predation management methods.

Your answers to the questions below are needed to help prepare reliable statistics. Response to this survey is voluntary, and individual reports are kept confidential. Thank you for your cooperation.

- 1) Name of the county where your farm is located. _____
- 2) What is the total acreage of your farm? _____ acres.
- 3) What is the total acreage you currently devote to livestock? _____ acres.
Grazing _____ acres Feedlot _____ acres
- 4) On average how much livestock of each type do you have on your farm?
Cattle _____ Sheep _____
Pigs _____ Poultry _____
Other _____ ; how many _____
- 5) Do vultures attack your livestock? ☐ YES ☐ NO
If YES, proceed to next question. If NO, then skip to question 13.
- 6) What time of year do vultures attack your livestock? (Check all that apply)
☐ January ☐ April ☐ July ☐ October
☐ February ☐ May ☐ August ☐ November
☐ March ☐ June ☐ September ☐ December
- 7) What time of day do vultures attack your livestock? (Check all that apply)
☐ Morning (5am to 10am) ☐ Evening (3pm to 8pm)
☐ Mid day (10am to 3 pm) ☐ Night (8pm to 5am)
- 8) Are your newborn livestock attacked by vultures? ☐ YES ☐ NO
- 9) Are your animals attacked while giving birth? ☐ YES ☐ NO
If yes, are first-time reproductive females more likely to be attacked than older female animals?
☐ YES ☐ NO
- 10) Are there other conditions under which your livestock are frequently attacked by vultures?
☐ YES ☐ NO
If yes, please specify: _____
- 11) Each year how many animals do you lose to vulture attacks, and what is the value of the animals lost?

	Newborn	Yearling	Adult	Total Value
Cattle	_____	_____	_____	_____
Sheep	_____	_____	_____	_____
Pigs	_____	_____	_____	_____
Poultry	_____	_____	_____	_____
Other _____	_____	_____	_____	_____

Appendix (continued)

- 12) Please list the measures you take to prevent vulture attacks on your livestock, indicate the effectiveness of each method (mark the best choice), and provide the cost (in dollars) of implementing each method per year.

Method	Effectiveness			Cost/Year
	Very	Somewhat	Not	
a)				\$
b)				\$
c)				\$
d)				\$
e)				\$

- 13) How many animals do you lose annually to coyotes, and what is the value of the animals lost to coyotes?

	<i>Newborn</i>	<i>Yearling</i>	<i>Adult</i>	<i>Total Value</i>
Cattle	_____	_____	_____	_____
Sheep	_____	_____	_____	_____
Pigs	_____	_____	_____	_____
Poultry	_____	_____	_____	_____
Other	_____	_____	_____	_____

- 14) Finally, we would like your opinion on some issues. Please indicate if you strongly disagree (SD), disagree (D), are neutral (N), agree (A), or strongly agree (SA) with the following statements. There is no right or wrong answer; we are interested only in your opinion. If you do not have an opinion on an issue, you may answer "unsure".

Statement	SD	D	N	A	SA	Unsure
A. Vulture predation to livestock is a problem on my farm.						
B. Numbers of vultures in my area are increasing.						
C. Current methods for controlling vulture problems are not adequate.						
D. Vultures play an important role in nature.						
E. On my farm, vulture predation on livestock has increased over the last 5 years.						
F. Compared to damage done by coyotes, livestock lost to vultures is not significant.						
G. Vultures do not attack and kill healthy animals.						
H. Some losses due to vulture predation are inevitable in every livestock operation.						
I. Regulations to protect vulture populations are not necessary.						

Form # 12345

Thank you for participating in this survey. If you check the space below and fill in your mailing address, we will be happy to provide you with a copy of the results of this study.

_____ Yes, I would like to receive a copy of the results of this survey.

Name: _____

Address: _____

City/State/Zip: _____